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To: E. B. Sanders **Date:** October 1, 1991

From: F. P. Gullotta

Subject: Operational Plans for the Sensory Technology Program

Sensory Technology Program

The purpose of the Sensory Technology Program is to develop a fundamental understanding of the sensory characteristics of current and future products in order to improve their commercial success. The program's ***initial*** efforts will be directed toward developing: 1) a sensory enhancement/replacement for nicotine; 2) methods to optimize the flavor and impact of low tar/low nicotine products; and 3) a flavor delivery system for nonconventional smoking articles. Subsequent to accomplishing initial goals, we will embark upon additional aspects of the program.

In order to accomplish these goals, it will be necessary, over the next several years, to: 1) fund research laboratories that possess special abilities to address specific sensory issues of importance to P.M.; 2) network with sensory experts (e.g., Monell, Association for Chemoreception Sciences (AChemS), etc.) in order to keep abreast of current developments; 3) utilize the expertise of our overseas colleagues (i.e., INBIFO); 4) redirect our in-house resources toward program objectives; and, 5) hire additional experts in unrepresented or under-represented areas.

Since the objectives for the program are diverse in scope, each is listed separately, together with pertinent strategies and tactics.

Objective

To develop low alkaloid and low tar/low alkaloid cigarettes that have sensory characteristics superior to currently available products.

A. *Half-Nic (1992)*

Strategy #1

Develop an analytical approach to the measurement of the acid/base character of filler and smoke.

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Tactics

Investigate the historical application of standard techniques to measure the acid/base character of filler and smoke. (ARD - Complete December, 1991).

Explore other techniques for measuring the acid/base character of filler and smoke. (ARD - Complete March, 1992).

Devise experiments to test new and past methods of measuring the acid/base character of filler and smoke. (ARD - Complete June, 1992).

Strategy #2

Determine whether filler "pH" modifications of reduced alkaloid cigarettes will result in cigarettes with subjective properties comparable to higher alkaloid cigarettes.

Tactics

Conduct subjective and sensory evoked potential experiments using cigarettes made from filler which varies in "pH". (FTD, BCR - Complete January, 1992).

Based upon data obtained above, optimize filler modifications and cigarette construction to achieve subjective goals. (FTD - Complete April, 1992).

Strategy #3

Investigate the kinetic effects of nicotine at various "pH" levels.

Tactic

Conduct mechanistic studies to determine how "pH" alters the time course of observed responses. (INBIFO - Complete June, 1992).

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Strategy #4

Investigate the distribution of smoke particle size at different "pH" levels.

Tactic

Conduct experiments employing light extinction spectrometry to investigate the distribution of smoke particle size in "pH" modified filler. (PRD - Complete February, 1992).

Strategy #5

Determine the distribution and hydration state of nicotine in smoke at different "pH" levels.

Tactics

Develop and conduct vapor-liquid equilibrium (VLE) experiments to measure the concentration of free base nicotine in vapor at various "pH" levels. (PRD, Technology Assessment - Complete April, 1992).

Following the above, determine the species distribution of nicotine at various "pH" levels. (PRD - Complete July, 1992).

B. *De-Nic (1994)*

Strategy

Develop a fundamental understanding of how nicotine affects sensory systems.

Tactics

Compile published information on the mechanisms by which nicotine affects chemosensory systems. (PED - Complete January, 1992).

Compile published information on how local events in the receptor environment (e.g., salivary pH) affect sensory responses to cigarettes. (PED - Complete January, 1992).

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Develop experimental models which can be used to screen for olfactory and trigeminal stimulants that have nicotine-like sensory effects. (Erlangen, FRG - Begin June, 1991 - Complete December, 1991).

Transfer experimental sensory methods developed in Erlangen, FRG to INBIFO. (INBIFO - January, 1992).

Evaluate test compounds (using above models at INBIFO) which have been determined to be potential sensory substitutes or modifiers for nicotine. (INBIFO - Begin 1992).

Conduct sensory evoked potential and subjective evaluations of promising and acceptable sensory substitutes for nicotine at P.M. Richmond. (BCR, FTD - As available).

Identify, negotiate with, and fund laboratories with pertinent expertise to develop receptor assays for olfactory and trigeminal systems. (BCR - Begin identification process during 3rd quarter of 1991).

C. ***Low Tar/High Flavor***

Strategy

Utilize the information gained from A and B to produce an acceptable low tar/high flavor product.

Objective

To develop a flavor delivery system for use in nonconventional smoking articles by 1995.

Strategy

Investigate the subjective and electrophysiological properties of nicotine in a simpler, more controllable fashion utilizing a nicotine aerosol system(s).

Tactics

Evaluate the analytical and sensory characteristics of various nicotine aerosol systems. (PRD, BCR - In Progress).

Conduct subjective and sensory evoked potential evaluations of nicotine aerosols at various pH levels. (BCR, PRD - Complete Pilot Investigations October, 1991).

Perform subjective and sensory evoked potential studies on nicotine aerosols at various pH and menthol levels. (BCR, PRD - Complete March, 1992).

Conduct subjective and sensory evoked potential investigations of nicotine aerosols containing to-be-identified flavorants and sensory enhancers. (BCR, PRD - Begin 1992).

1992 Resource Allocations

DIVISION	PERSONNEL (man-years)
Biochemical Research	3.5
Chemical Research	1.0
Product Evaluation	1.0
Analytical Research	1.5
Physical Research	0.5
Flavor Technology	2.0
Technology Assessment	0.25

Technology Transfer

We anticipate that the Sensory Technology Program will yield information with direct product applications. Therefore, the most likely route of technology transfer would be to Flavor Technology for the evaluation of product candidates. From there, candidates would be transferred to PED for POL evaluations.

/mps

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J. Charles

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R. Comes
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R. Ferguson
H. Grubbs
W. Hempfling
D. Heretick
K. Houghton
R. Kinser
C. Lilly
B. Losee
R. McCuen
J. Myracle
S. Nelson
H. Spielberg
J. Whidby
G. Yatrakis